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UTILITY OF AUTOMATION OF ORDER OF BATTLE AND TARGET INTELLIGENCE DATA FOR INTELLIGENCE ANALYSIS

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U. S. Army

Research Institute for the Behavioral and Social Sciences

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The need to develop a capability to process increasing amounts of intelligence information input by battlefield systems to divisions has led to the establishment of an Army work program to determine user requirements for a Tactical Operations System (TOS). As part of the program, a series of software packages is being evaluated by the Army Research Institute for the Behavioral and Social Sciences for potential inclusion as requirements for a prototype TOS. The first of these packages--automated Order of Battle (OB) and Target Intelligence (TI) files--was evaluated in the present study. A series of intelligence

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20. tasks was accomplished by two groups, each consisting of 10 subjects qualified as intelligence analysts. Both groups worked with a basic simulated TOS. The experimental group had access to automated OB and TI files; the control group used OB and TI files in manual form. Automation of the files significantly increased both the accuracy and the completeness with which intelligence requirements were accomplished but did not increase the speed of completion of those requirements.

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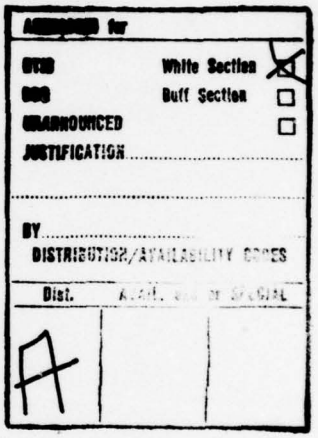

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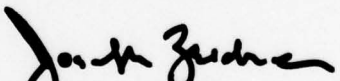
FOREWORD

The Army Research Institute for the Behavioral and Social Sciences (ARI) conducts research on tactical information systems with particular emphasis on the human factor in battlefield command/control and intelligence functions and operations. The support and extension of human capabilities by computer technology is necessary to meet the challenge of the modern battlefield. Cost considerations call for careful attention to the performance increment attainable for alternative computer applications and aids. The ARI research program in this domain is independently and jointly executed by the Battlefield Information Systems Technical Area in Alexandria, VA and the ARI Field Unit at Fort Leavenworth, Kansas.

The present report describes research accomplished by the Fort Leavenworth Field Unit to determine the efficacy of a Functional Applications Package (FAP) designed to automate order of battle and target intelligence files. The design and evaluation of candidate FAP's for inclusion in the requirement specifications for the developing Tactical Operations System (TOS) is part of the Army's overall effort to insure a user oriented, performance enhancing, affordable TOS.

This research was done under Army Project 2Q763743A774, "Man/Machine Interface in Integrated Battlefield Control Systems" in response to special requirements of the Combined Arms Combat Development Activity, Fort Leavenworth, Kansas.



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UTILITY OF AUTOMATION OF ORDER OF BATTLE AND TARGET INTELLIGENCE DATA FOR INTELLIGENCE ANALYSIS

BRIEF

Requirement:

To evaluate Order of Battle (OB) and Target Intelligence (TI) files as additions to the Enemy Situation (ENSIT) data base of the Tactical Operations System Test Bed Simulation, with special emphasis on the effect of automating the files on the speed, accuracy, and completeness of performance.

Procedure:

As part of an on-going research program to develop software applications for inclusion in the Army's Tactical Operations System (TOS), a series of Functional Application Packages (FAPs) is being developed at Fort Leavenworth, Kansas. FAPs that are favorably evaluated will be included as requirements for the prototype TOS Definition. Evaluation of the first of the series is the subject of the present report. Twenty qualified intelligence analysts participated. Ten analysts attempted to accomplish a series of intelligence tasks with the aid of the simulated basic TOS, including automated OB and TI files (experimental condition); the remaining 10 attempted to accomplish the same tasks with the aid of the basic simulated TOS and manual OB and TI files (control condition. Performance was evaluated in terms of timeliness (task completion time), accuracy, and completeness.

Findings:

Automating OB and TI files significantly increased the accuracy and completeness with which selected intelligence requirements were processed. However, task completion time did not differ significantly for the two groups. Information could be retrieved from manual files as quickly as from automated files, through the use of a data base management system.

Utilization of Findings:

The findings of the investigation, in conjunction with other cost-effectiveness considerations, provide basic data for use in deciding whether or not the FAP should be included in the Required Operations Capabilities document for TOS.

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UTILITY OF AUTOMATION OF ORDER OF BATTLE AND TARGET INTELLIGENCE DATA FOR INTELLIGENCE ANALYSIS

BACKGROUND

The need to develop a capability to store, retrieve, correlate, and filter increasing amounts of information for input by battlefield systems to a division has led to the establishment of an Army work program to determine user requirements for a Tactical Operations System (TOS). The U.S. Army Combined Arms Combat Developments Activity (USACACDA) is the Army's proponent for TOS; the Combined Arms Center (CAC)--specifically, the Command Systems (CS) Division of USACACDA--is in the process of defining user requirements for a TOS. The FY 76 work of the CS Division concentrated on developing requirements for a division level TOS that was intended, initially at least, to support the command and control process by increasing the ability of the staff (primarily the G2) to make more timely and accurate intelligence (as well as combat information) available for the commander's consideration.

An automated system to support command and control activities at higher levels of tactical command is needed because of the development of other automated data acquisition and processing systems, e.g., the Tactical Fire Direction System (TACFIRE), the Position Location and Recording System (PLARS), and the Remotely Monitored Battlefield Sensor System (REMBASS). The proliferation of these automated information and collection and processing systems underscores the need for development of a command and control ("centroid") system that has the capability of storing, retrieving, correlating, and filtering the diverse and large volumes of information that will flow from other specialized acquisition and processing systems into division level command posts.

CAC has established a review panel to monitor and steer the TOS requirements definition program. As applications are identified, the Review Panel, which includes Army-wide representation, reviews candidate applications and makes a decision as to whether or not they should be developed and evaluated (validated).

Each software application[1] being developed for TOS is referred to as a Functional Applications Package (FAP). Also, each FAP is designed to support or build on its predecessor. The Army Research Institute (ARI) has an on-going program of research at Fort Leavenworth to identify and evaluate potential automation assists for the commander and staff.

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[1] Note that each potential application CAC identifies is programmed to run on commercial hardware, primarily the CDC 6500/6400 computer in the Data Processing Field Office of the Army Training and Doctrine Command (TRADOC). Thus, CAC simulates each potential requirement it identifies for the eventual TOS system and evaluates that application to determine if it is indeed a valid requirement which should be included in the prototype requirements specification.

As each FAP is identified and designed, it is evaluated by ARI to determine if the addition of the application significantly enhances the performance of the individual or group of individuals that the application was intended to serve. The results of the evaluation then provides feedback to USACACDA concerning how their own resources should be utilized in the future, for example, whether to modify or continue development of the application or reject it as a candidate for the TOS prototype definition.

Results are intended as preparation for the TOS Army Systems Acquisition Review Council/Department of Defense Systems Acquisition Review Council (ASARC/DSARC) II meetings. Results also provide TRADOC's System Analysis Agency (TRASANA) with data which could be used in the cost effectiveness analysis of TOS, a requirement for the ASARC/DSARC II meetings.

On 24 October 1975, the CAC TOS Review Panel met and approved the first Functional Application Package (FAP 1) for development and evaluation, as appropriate. The specific application package consisted of the Order of Battle (OB) and Target Intelligence (TI) data files. The OB and TI files were developed to "round out" the automated Enemy Situation (ENSIT) data base.

An OB file was deemed necessary to serve as a repository for data required for detailed analysis of enemy unit capabilities vis-a-vis combat effectiveness, status of men and equipment, and commander's identification and personality characteristics. The target intelligence file was designed to provide a capability for storing data on past targets and potential targets. It was designed (to the extent possible) to be compatible with TACFIRE message formats and thus to facilitate TOS's eventual interface with the Field Artillery's Tactical Fire Direction System.

PURPOSE

ARI designed and conducted an experiment to evaluate the effectiveness of the first FAP, which was developed during FY 76. The experiment was designed to determine how quickly, accurately, and completely intelligence-related tasks could be accomplished with the aid of automated OB and TI files augmenting the basic TOS system in comparison with the same intelligence tasks accomplished with the aid of the basic TOS system and manual OB and TI files. (See Appendix A for references which describe the basic CAC simulated TOS system, before addition of FAP 1.)

A secondary purpose of the experiment was to identify strengths and weaknesses of the automated OB and TI files in terms of the number and types of data elements designed into them.

METHOD

SUBJECTS

Twenty military intelligence analysts, ten in each of two treatment conditions, participated in the experiment. The analysts all had MOSs that would qualify them to work in the analysis and production element of the Division G2 Section.

RESEARCH DESIGN

A simple experimental group versus control group design (treatment versus no treatment) was used to evaluate the effects of automating OB and TI data files. The two groups were approximately balanced in terms of analysts' length of military service and MOS-related experience (combat and peacetime). Analysts in the experimental group had access through the General On-line Query System (GOQS) to information resident in the ENSIT data base, including OB and TI data. In the control condition, subjects had access to all information, via GOQS, except that in the OB and TI files. They could obtain this information from manual card files to which they had access. Thus, both groups had access to identical information, the experimental group to automated files, the control group to manual files. The manual OB and TI files used by the control subjects were constructed for that purpose by, OB analysts from Fort Hood, and thus were representative of those currently used in the field.

PROCEDURE

Analysts in both experimental and control conditions were required to answer a series of nine questions. The questions were generally representative of questions an OB analyst in the analysis and production element of the Division G2 Section would be expected to answer. The questions used are presented in the Technical Supplement.

For each of the first eight questions, the analysts in both conditions were evaluated in terms of the time required to answer the question, the accuracy of the response, and the completeness of the response. A "correct" or best answer was not available for the ninth question which required a summary estimate of enemy capabilities. This question was included to obtain data as analysts constructed a solution on the types of queries generated, the frequency of accessing the ENSIT data files and the particular data codes within files that were accessed. This kind of information can be useful for evaluating the utility of the system's data files. Due to a breakdown in computer system procedure these data are not addressed in this report. A detailed description of the experimental procedure and variables that were controlled to prevent their biasing the results is provided in the Technical Supplement.

FINDINGS AND CONCLUSIONS

The experimental group's performance was significantly superior to the control group's performance in terms of accuracy and completeness. There were no differences in the performance of the two groups in terms of the speed with which the eight tasks were accomplished. Thus, it was concluded that the addition of the FAP 1 module to the basic TOS/GOQS test bed improved the quality of the performance of those individuals that the application was primarily designed to support. Note that only one aspect of the total system was evaluated, and that the evaluation took place within highly controlled and structured conditions. Therefore, caution should be used in generalizing these results to any other aspect of the system or to the system's overall usefulness in a field environment.

DISCUSSION

The results of this experiment support two of the major suppositions that underly the development of TOS, as well as command and control support systems in general. Both the reliability and completeness of reports and data extracted or transmitted by the automated system are greater than can be achieved through use of manual procedures. These findings, of course, were obtained with a "clean" data base--one that contained few, if any, errors, and was obtained under highly structured or controlled conditions. The results did not support the third supposition, perhaps the most significant one, that retrieval of information through the use of automation is faster than manual processing. This finding could very well be an artifact of the size of the data base used, which consisted of approximately 200 messages, a number much smaller than one would expect to develop in a combat environment where messages are received from many sources, both internally (within the division TOC or command post) and externally (from subordinate and attached units and perhaps, eventually, from other divisions, from corps, and from other tactical data systems). As the size of a data base or the volume of message traffic increases, the benefits of automation, in terms of the speed with which this volume of message flow can be processed, accessed, and transmitted, should increase appreciably. This conjecture, obviously, assumes that expedient methods (man/machine systems) are developed for entering data into the system.

The findings of this analysis may also be interpreted in terms of the criteria that may be used in combat situations or simulated combat situations to evaluate the performance of intelligence personnel like those who participated in the present study. On a prima facie basis and especially considering the size of the data base used in this experiment, the findings are rather surprising. If anything, one would have expected no performance differences for the accuracy and completeness criteria, since the same information was available to the subjects in both conditions and in a very concise file form for the subjects in the manual (control) condition. Also, the subjects in the control condition were told to work quickly, yet not to allow accuracy and completeness to suffer. Thus, they were not really under time pressure per se.

However, the control subjects did complete the tasks given them relatively quickly, and the accuracy and completeness of their responses suffered. In combat situations and simulated combat situations, it is probably often impossible to determine precisely whether reports received or intelligence tasks accomplished are totally reliable. It is extremely easy in these situations, however, to determine whether or not a given task is accomplished quickly. Thus, performance in these situations is probably evaluated, for the most part, in terms of its timeliness, which results in strengthening this performance dimension to the detriment of other highly relevant performance dimensions. If this interpretation is correct, it suggests that the training intelligence personnel receive, particularly on-the-job training, should stress, to the extent possible, the tradeoffs between expeditious functioning per se and expeditious functioning which includes rigor regarding the reliability of the information processed and the estimates developed. This reasoning would apply to the training of G2 Section staff to process information either manually or with the assistance of automation.

TECHNICAL SUPPLEMENT

METHOD

SUBJECTS

Twenty intelligence analysts participated in the experiment, ten in each of two treatment conditions. All had MOSs that would qualify them to work in the analysis and production element of the Division G2 Section.

The sample was drawn from several locations or units, including USAICS, III Corps, the Fourth Infantry Division and the 82d and 101st Airborne Divisions. An attempt was made to equate the two groups in terms of length of military service, MOS-related experience during combat, and MOS-related experience during peacetime, a set of variables that were conjectured to have potential impact on the subjects' performance of the tasks imposed during the experiment[2] (Table 1). One-way analyses of variance were used to evaluate the similarity/dissimilarity of the two treatment groups in terms of the three variables. None of these tests proved significant at the .05 level: (length of military service $F = .003$, $df = 1,18$; experience-combat $F = .01$, $df = 1,18$; MOS experience-peacetime $F = .01$, $df = 1,18$), indicating that the balancing of these variables between the two groups had been accomplished with reasonable success.

Table 1

AVERAGE MONTHS OF MILITARY SERVICE, MOS SERVICE IN COMBAT, AND MOS SERVICE IN PEACETIME FOR EXPERIMENTAL AND CONTROL GROUPS

Experimental (n=10)			Control (n=10)		
Military Service	MOS Service (Combat)	MOS Service (Peacetime)	Military Service	MOS Service (Combat)	MOS Service (Peacetime)
-	-	-	-	-	-
X=85.4	X=4.8	X=19.5	X=87.5	X=4.3	X=20.8
sd=86.55	sd=10.12	sd=19.88	sd=97.14	sd=8.06	sd=29.11

[2] MOS experience and the time in service of the analysts was extremely variable, as reflected in Table 1. For military service, MOS-related service (combat) and MOS-related service (peacetime), the ranges were 9-276 months, 0-24 months, and 2-96 months, respectively.

RESEARCH DESIGN

The analysts performed a series of tasks in one or the other of two treatment conditions:

1. In the experimental condition, the subject was allowed to access, through a computer terminal operator familiar with GOQS and the ENSIT data base, the information resident in that data base (including OB and TI file data), to obtain answers for a series of intelligence related questions.

2. In the control condition, the subjects were allowed to access information from the ENSIT data base (through the same terminal operator available for the experimental subjects) excluding the OB and TI files. OB and TI data were available to these subjects only in manual file form. The manual OB and TI files contained information identical to that in the automated files.

DEVELOPMENT OF THE MANUAL OB AND TI FILES

Two OB analysts (both holding MOS 96B40) were brought to CAC from III Corps, Fort Hood, Texas, for the purpose of developing the manual data files. These particular analysts were selected because of their reported high level of expertise in the OB area. A printout of the data base that had been generated to support a demonstration of FAP 1 and the present experiment (based upon a Command and General Staff College scenario, R1220--a non-classified scenario developed from SCORES Europe 1, sequence 2A) was provided to the analysts. After being instructed how to extract appropriate data from the printout, the analysts were told to develop a manual file of the information, in a form which they used in division CPX's (and, in the case of one analyst, as he had used during combat in Vietnam).

After the analysts had finished the manual file, two project officers (a major and a lieutenant colonel) from the Command Systems Division independently checked the contents of the manual file against the computer printouts of the OB and TI files to verify that all information from the printouts had been accurately and completely transferred. Minor editings were made on the basis of this review.

SUPPORT PERSONNEL

Two support personnel, a computer terminal operator and the experimenter, were present when each participant was run. The computer terminal operator retrieved data from the computer's base for the participant. In essence, he represented the analyst's training in the use of the computer system and thus served as a "servo" for the subject.

The computer terminal operator was a member of BDM Services Company's staff, the CS Division's contractor who developed FAP 1 as well as the other ENSIT files and GOQS. This operator was also responsible for coding and loading the data base that supported the experiment. Thus, he was thoroughly trained in translating natural language questions into correct system compatible queries and could translate or interpret the resulting output for the subject.

The experimenter was present to answer any questions the analyst might have regarding the general purpose of the experiment, the role he was to play, and the task(s) he was requested to perform. The experimenter was allowed to answer only general questions regarding the specific task. He could explain what information the question asked for, but was not permitted to explain or suggest what questions the analyst might need to ask in order to satisfy the requirement. The experimenter also recorded, with a stopwatch, the following time intervals:

1. Task completion time. Elapsed time between presentation of a task to an analyst and the analysts' completion of that task. Task completion time was recorded for each subject on the form attached as Appendix B.

2. System query composition time. Time required for the computer terminal operator to construct and "send" a system compatible query after receiving an information request from the analyst (aborted attempts, i.e., construction of a system incompatible query and its rejection by the system, were also recorded[3]). Although the computer terminal operator was proficient with the system at the outset of the experiment, it was necessary to gather data on his performance during all trials for both treatment conditions in order to verify that performance improvements (if any) were equated for the two groups. Composition time was recorded on the form attached as Appendix C.

3. Output annotation time. The interval of time between the operator's receiving hard copy from the computer and translating (annotating) that output in a form understandable to the analyst. Annotation time was also recorded on the form attached as Appendix C.

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[3] Note that the terminal operator might have to compose more than one system query to provide the information requested by the analyst. Operator query composition time was recorded for each sub-question, whether correct (system compatible) or incorrect (system incompatible). Also, whether or not the query the operator constructed met the requirements stated by the analyst was recorded, as it was possible the operator could have misunderstood what the analyst requested. Appendix C contains the form that was used to document terminal operator performance for those dimensions discussed.

4. Computer response time. The computer that was used in the experiment is shared on a time basis with a large number of other users. Thus, turnaround time was dependent upon the capacity of the machine and the number of users it was serving at any given point in time. Because the machine could not be relied upon to provide a consistent response interval, its performance was also recorded. Specifically, two time intervals were recorded: (1) Post query computer response time, the interval of time from "sending" (command to execute a query) to receipt of a response in hard copy form (either an error message or the data requested); and (2) "Call G" response time. In order to input a GOQS query, it is first necessary to initiate a "Call G" command. This action essentially commands the system to prepare itself for the entry and subsequent execution of a GOQS query. Again, the time necessary to process this command was dependent upon the state of the computer system, i.e., the number of other jobs being processed at a given moment. The lag time between the "Call G" command and the receipt of a "clear" response from the computer along with post query computer response time was recorded on the form shown in Appendix C for each transaction within trials for both treatment groups.

PROCEDURE

Prior to actual participation in the experiment, the experimenter provided each analyst with a set of general instructions that specified the purpose of the experiment and in what capacity the analyst was to support the effort. These instructions are included as Appendix D, Part I and Part II, for the experimental and control conditions, respectively. After the analyst read these instructions, he was given the following material to study:

1. A composite map made up of the following sections: USACGSC 50-229, Europe, Sheet 1, (Friedburg - Frankfurt), Edition 1974, 1:50,000; USACGSC 50-245, Europe, Sheet 1, (Fulda - Lauterbach), Edition 1975, 1:50,000; USACGSC 50-246, Europe, Sheet 1 (Schluchtern - Bad Kissingen), Edition 1975, 1:50,000; USACGSC 50-249, Germany, Sheet 1, (Nidda - Ulmbach), Edition 1975, 1:50,000; USACGSC 240-138, Western Europe, Sheet 1, (Kassel - Fulda), Edition 1975, 1:50,000. On this map was an overlay depicting the position of friendly units and enemy units known to be in contact along the forward edge of the battle area (FEBA).

2. A description of the general and special situation of the 54th Mechanized Infantry Division, a unit assigned to the 10th US Corps in the R1220 scenario and the one to which the participant assumed he had been assigned for purposes of the experiment. The description of the general and special situation of the 54th Mechanized Infantry Division is attached as Appendix E.

The analysts in both treatment conditions were given 15-30 minutes to study the above materials, including the general instructions. The analysts in the control condition were given an additional 30 minutes to study the composition and contents of the manual OB and TI files they were to use in the experiment. To assist them in becoming familiar

with and retrieving information from these files, they were requested to provide answers for a selected set of questions. These questions are included as Appendix F. The sequence of events subsequent to the general orientation period are described below separately for the experimental and control conditions.

CONTROL CONDITION

The situation map, the description of the general and special situation of the 54th Mechanized Infantry Division, and the manual OB and TI files were made available for reference and use by the analysts in this condition throughout the remainder of the experiment. Other materials, including blank index cards (which could be used to update the manual OB and TI files as the experiment progressed), pencils (both lead and grease), and paper were available as well. Only the computer terminal operator and experimenter were present when the analyst was run. The experimenter provided the analyst with a set of detailed instructions at the outset of this period. Basically, these instructions (Appendix G) informed the analyst that he was to provide answers to a series of nine questions that would be presented to him one at a time and that he could access information from his manual files, the computer's data base, or both, to satisfy each of the requirements. The questions and the instructions as to exactly what form his response was to take for each question are presented below:

1. What battalion or larger size units are located within Coordinates NA0087, NA0077, NA1077, NA1087? Plot (using appropriate symbology) all the units you have identified on the situation map.

2. What are the <u>effective</u> personnel strengths of the units within Coordinates NA0087, NA0077, NA1077, NA1087? Record each unit and the corresponding strength figure for it on the data sheet provided.

3. What major items of TO&E equipment are <u>operational</u> for the 1st Battalion of the 22d Motorized Rifle Regiment of the 18th Mechanized Infantry Division? Record each equipment category and the corresponding number of operational items on the data sheet provided.

4. What is the <u>operational</u> tube strength of the 1st Battalion of the 61st Artillery Regiment of the 18th Mechanized Infantry Division? Record your answer on the data sheet provided.

5. How many 152 and 122mm guns are <u>located</u> and <u>operational</u> within Coordinates NA0087, NA0077, NA1077, NA1087? Record the number of operational 152 and 122mm guns on the data sheet provided.

6. What regimental and higher level command posts are located within Coordinates NA0087, NA0077, NA1077, NA1087? Plot (using appropriate symbology) the CP locations on the situation map.

7. What bridging emplacements on river crossing points have been identified within Coordinates NA0087, NA0077, NA1077, NA1087? Plot (using appropriate symbology) these emplacements on the situation map.

8. What FROG/SCUD sites are located within Coordinates NA0087, NA0077, NA1077, NA1087? Record the coordinates of sites located on the data sheet provided.

9. Will the enemy attack?
Check One.

☐ Yes

☐ No

(a) If your answer was no, stop.

(b) If yor answer was yes:

1. Specify what course of action will probably be pursued by each of the major (divisional) elements you have identified.

2. Where will the breakthrough occur?

3. Who (what units) will instigate it?

4. What is your best estimate of when an attack will occur (specify in hours and/or minutes)?

5. List the authorized and effective personnel strengths for each of the division level enemy units you think will participate in the attack.

6. List the major items of equipment for each of the division level enemy units that you think will participate in the attack and indicate the effective strength of each equipment category.

Each of the first eight questions and the instructions that appeared with them were typed on 5 x 7-inch index cards. The last question was printed on a separate sheet and appeared just as it does above. The questions were presented to the participant one at a time and each succeeding one was presented only after the analyst had signaled that he had completed the previous question.

For the first eight questions, the terminal operator knew where the appropriate information resided, since this portion of the experiment was essentially "canned" and had been pilot tested several times in order to refine the procedures and to determine the residence of the data needed to answer each question. Thus, for this set of questions, the following sequence of activities occurred for each question. The experimenter presented the card on which the question appeared to the analyst and simultaneously started the stopwatch. If the data requested by the analyst to answer the question resided in his manual files, the terminal operator immediately informed the analyst of this and instructed him to search for the information there.[4] If the information requested resided solely in the computer's data base, the terminal operator informed the analyst of this and immediately began to construct a system query that would produce the information. Finally, if the data resided in both computer and manual files, the analyst was again instructed that he should begin retrieving from the manual files since a portion of the data did reside there. The terminal operator waited until the analyst had finished his search before he began accessing the information in the computer's data base. (This procedure was sometimes reversed, i.e., the computer terminal operator retrieved first and the analyst then searched his files for the remainder of the information.) In the latter conditions (i.e., when data were retrieved from the automated data base), when hard copy was received, the terminal operator deleted those portions of the output which were retrieved from the OB and TI automated files. He then annotated the remaining output, just as he would have for any other system output. Following the completion of any one of these three possible sequences for obtaining the requested information and as soon as the analyst had completed his response in the form specified, the experimenter recorded the elapsed time (task completion time, as defined above).

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[4] Note that information in the OB and TI files may also be resident in other files, e.g., Enemy Unit Situation (EUS), which were a part of the previous TOS/GOQS package. In instances such as this and for this condition, the subject was given the information since it is not idiosyncratic to the OB and TI files.

For question 9,[5] the terminal operator translated each of the analyst's questions into a system compatible query, executed it, and searched the output to determine which files were accessed to compose the response. If any of the responses came exclusively from the OB and TI files, that portion of the output was deleted, and the remaining output was annotated. The terminal operator then provided the output to the analyst and immediately informed him that a portion of the data he had requested resided in his manual files. If the system responded that no data were available bearing on the participant's request, the operator immediately informed the analyst of this and requested that the analyst formulate another question. This process was continued until the analyst was satisfied that he had obtained all the data that he needed to make the estimates called for by question 9.

EXPERIMENTAL CONDITION

The procedure for participants in this condition differed only slightly from the one specified above for the control condition. Similarities and differences are highlighted below:

The same materials (with the exception of index cards for updating a manual file) were available for the analysts' use in this condition. The detailed instructions tailored for this condition are included as Appendix H. The analysts were given the same tasks in the same order and fashion as described for the control subjects. The same basic procedure was followed for questions 1 through 8 as well as for question 9: The terminal operator translated the analyst's request into a system query, executed it, annotated the output, and provided the annotated output to the analyst. In the event the information requested was not contained in the data base (which was possible for requests generated by question 9), a system query produced a negative reply and the terminal operator informed the analyst of this, requesting that he formulate another request. One further comment should be made regarding GOQs query elements. For each system query generated in both the control and experimental conditions, the following elements were included:

1. The coordinates (location) of the event or enemy unit identified.

2. The time the event occurred or the unit was identified.

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[5] Although the procedure used to obtain response data for this question is described, these data were not analyzed. A breakdown in procedure for automatically recording (via a computer log tape file) the system queries and attendant responses for this question resulted in the capturing of data when anyone accessed GOQS for system query generation. Thus, it was not possible, in all instances, to determine whether the log tape entries were in response to the analyst's requests during the experiment or a result of another user accessing the data base through GOQS.

3. The source that identified the event or enemy unit.

4. An evaluation, if available, of the source that provided the information.

5. A description of the event or activity reported.

6. Any "remarks" that were provided by the source.

It was necessary to include these elements as part of each system query since the pilot test had indicated that intelligence analysts, by virtue of previous training and experience with manual files, expected to receive this information regardless of whether or not they had specifically requested it.

RESULTS

The performance of analysts in both treatment conditions was evaluated in terms of three measures: timeliness (task completion time), accuracy (the degree to which the analyst's response correctly represented the data that were actually available), and completeness (the extent to which the analyst's response included all data that were available, regardless of the correctness of the data actually reported).

TIMELINESS

The basic measure for timeliness was task completion time, the interval between stimulus (task) presentation and completion of the response. For control analysts this basic measure was entered into the analysis just as it was recorded for all questions (tasks) except numbers 1, 6, and 7 where all or part of the data resided in the computer's data base. For these tasks in the control condition and for all tasks in the experimental condition, it was necessary to correct the basic timeliness score for output annotation and computer response time (both post query response and "Call G" response intervals). The amount of time taken to annotate the output for a given question was merely subtracted from the task completion time score for that question. Correction for computer response was less straightforward, however, and was accomplished in the following manner: Estimates of the two time intervals in question were obtained for each of the eight tasks when the computer system used in the experiment was unburdened[6] and when few users were accessing the sytem, under the assumption that the unburdened system's response would be similar to the response that would be obtained when using a dedicated system, as is envisioned for the eventual TOS. The difference between

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[6] Subjects were run on weekdays between the hours of 0800 to 1700, an interval when most transactions are processed on the system used. Thus, turnaround was usually extremely variable and slow, in some cases as long as 20 minutes.

the basic timeliness scores (corrected for output annotation) and the unburdened computer response estimates provided the final corrected timeliness measure. These measures were summed across tasks to yield an average task completion time score for each subject and an analysis of variance was performed on these data. A summary of that analysis is shown in Table 2.

Table 2

ANOVA SUMMARY OF TASK COMPLETION TIME (IN SECONDS) FOR EXPERIMENTAL AND CONTROL GROUPS

Source	ss	df	ms	f	p
Between	27232.2	1	27232.2	.015	ns
Within	33171322.8	18	1842851.27		
Total	33198555.0				

As Table 2 shows, there was no significant difference between the experimental condition (X = 5387.4, sd = 1776.19) and the control condition (X = 5293.6, sd = 743.01) in terms of time needed to complete intelligence tasks when corrections were made for the potentially confounding variables mentioned above. One additional variable, the proficiency of the computer terminal operator (system query composition time), was included in the task completion time score since it could have contaminated these results. The amount of time needed to construct system queries (including both correct or incorrect queries for a given question) was recorded for all system queries generated. The overlap between conditions (the questions for which system queries were generated) consisted of questions 1, 6, and 7, as indicated above. Figures 1, 2, and 3 show query composition time by trial separately for the two groups, for questions 1, 6, and 7 respectively. Mean query composition times were calculated for the data depicted in figures 1, 2, and 3 and correlated t-tests were run to determine, by question, whether or not query composition time differed for the two conditions. A summary of these analyses is presented in Table 3.

Table 3

ANALYSES OF TERMINAL OPERATOR QUERY COMPOSITION TIME DATA FOR EXPERIMENTAL AND CONTROL CONDITIONS

	Experimental Group (n = 10)		Control Group (n = 10)				
Question	$\bar{X}$	sd	$\bar{X}$	sd	t	df	p
1	169.1	28.96	183.6	43.14	1.70	9	ns
6	176.0	29.24	150.2	58.62	1.41	9	ns
7	100.2	22.38	115.6	38.89	1.39	9	ns

The analyses shown in Table 3 clearly indicate that there were no differences between the performance of the terminal operator for the experimental and control conditions. Although there appeard to be some improvement in the terminal operator's ability to construct system queries as the experiment progressed, the experimental and control trials were sequenced more or less randomly, which, apparently, balanced the operator's performance improvement across the two treatment conditions. It therefore seems reasonable to conclude that operator proficiency did not systematically influence the timeliness results of the experiment.

ACCURACY

An accuracy score was developed for each question by assigning an arbitrary number of points to that item. The number of points assigned for the item was, in large part, a function of the number of elements that a correct response would have addressed. Each element was then evaluated for its correctness/incorrectness. If the element was found to be incorrect, one point was subtracted from the total. Where the subject plotted information (unit locations, weapon sites etc.), the appropriateness of the symbology used and the position of a plotted unit compared to its actual or correct location were considered to be dimensions of the various elements of the response. In regard to plotting accuracy, a symbol was scored as being accurately plotted if it fell within a 50 meter radius of the known (correct) location. A point (or points, if the element consisted of more than one dimension) was subtracted for absent elements, just as if the element had appeared incorrectly. Thus an item was not considered totally accurate if it was not complete.

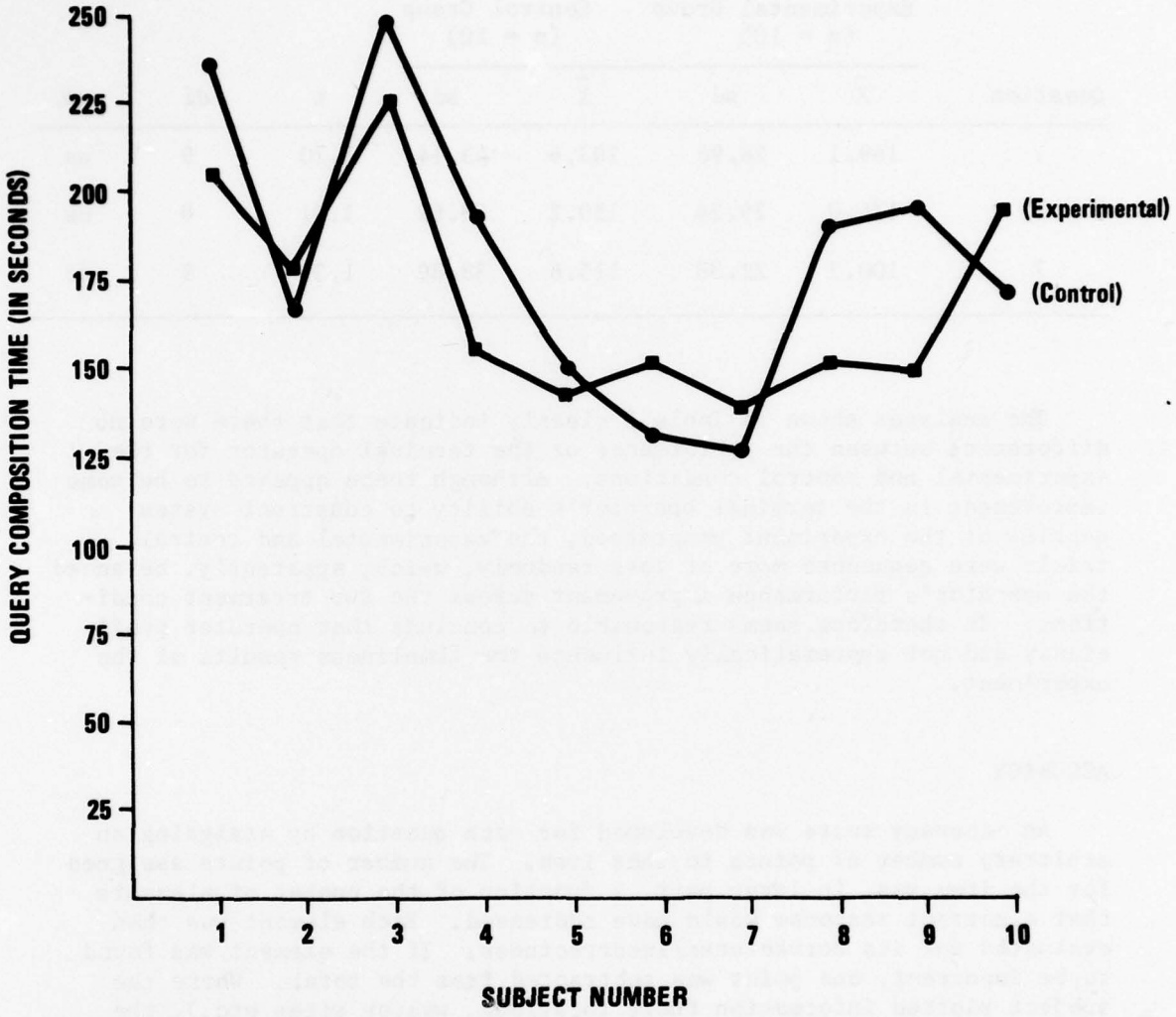

Figure 1. Terminal Operator Query Composition Time for Task 1 for Experimental and Control Groups across Trials.

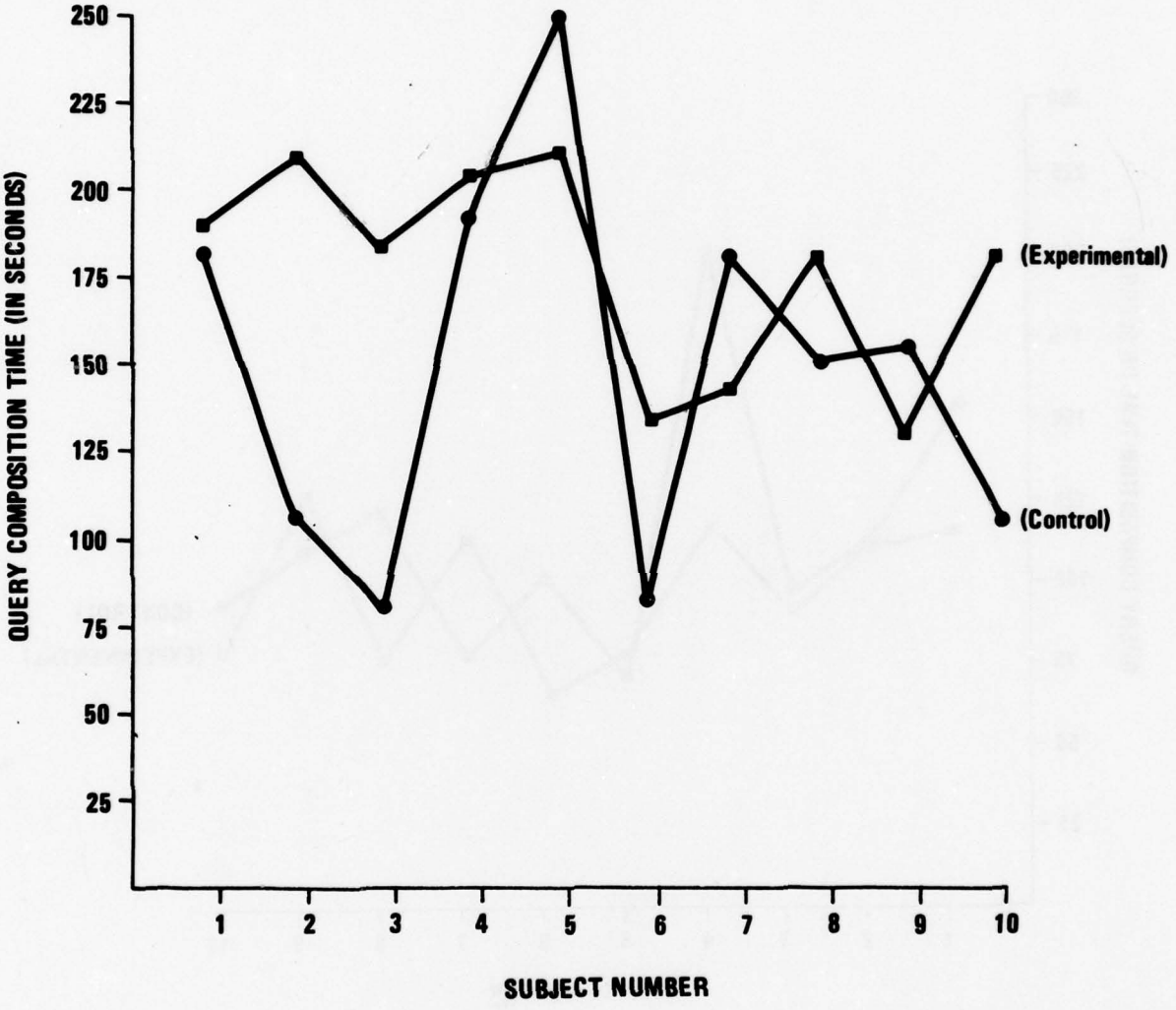

Figure 2. Terminal Operator Query Composition Time for Task 6 for Experimental and Control Groups across Trials.

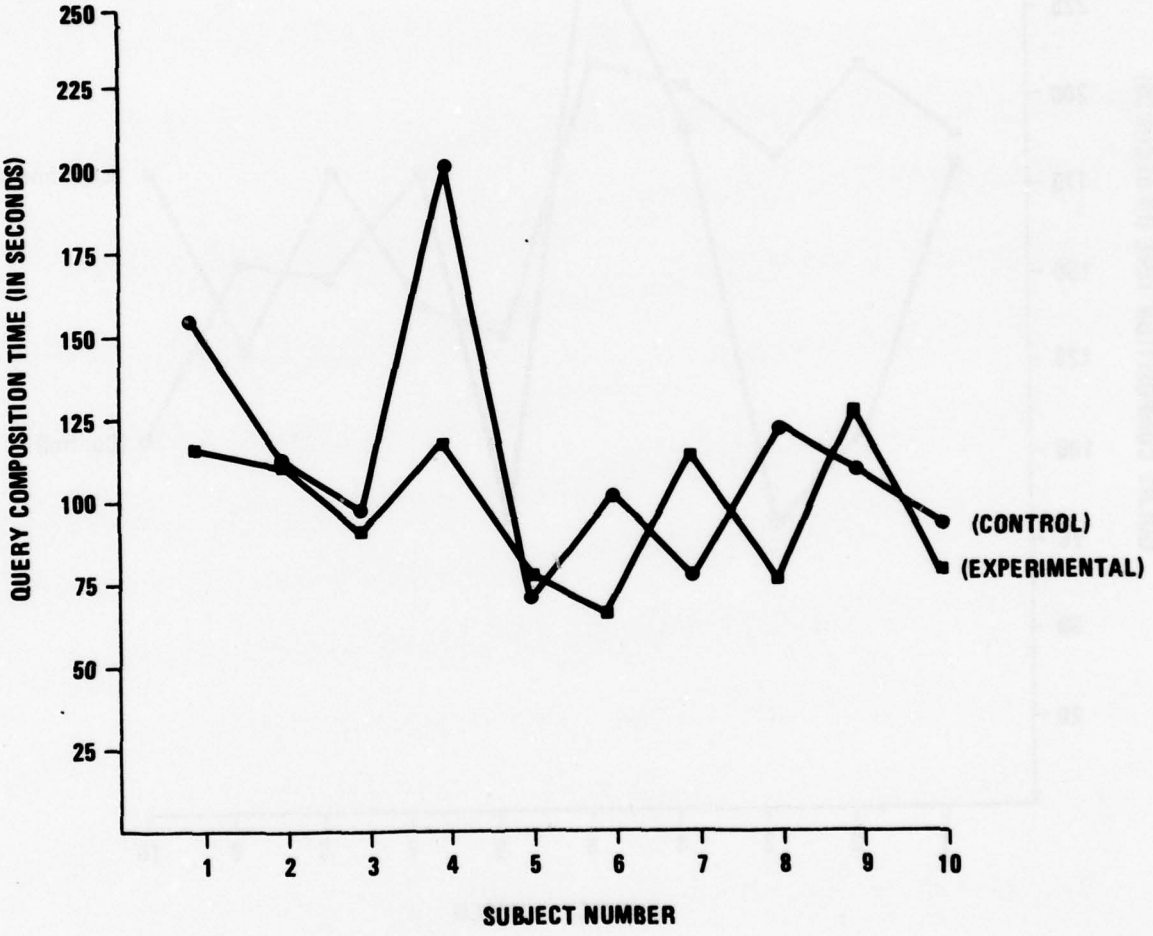

Figure 3. Terminal Operator Query Composition Time for Task 7 for Experimental and Control Groups across Trials.

Accuracy scores were summed across tasks and averaged to yield a mean accuracy score for each participant. An analysis of variance was then run to determine whether the automated OB and TI files significantly improved the accuracy of the subjects' performance. A summary of this analysis is shown in Table 4. This summary indicates that there was a highly significant difference between the experimental and control conditions. Examination of mean scores ($\bar{X} = 60.2$, sd = 6.94; $\bar{X} = 50.2$, sd = 6.61 for experimental and control groups, respectively) suggests that the experimental group's performance was highly superior to that of the control group. Thus, provided the data base is accurate, it appears that automation may very well assist in eliminating many errors when processing intelligence tasks.

Table 4

ANOVA SUMMARY FOR ACCURACY SCORES OF SUBJECTS IN EXPERIMENTAL AND CONTROL GROUPS

Source	ss	df	ms	f	p
Between	500.0	1	500.0	10.88	<.001
Within	827.2	18	45.96		
Total	1327.2				

COMPLETENESS

As was the case with the accuracy criterion, an arbitrary number of points was assigned for each question. The number of points assigned depended on the number of elements that appeared in the response (in many cases, fewer points were assigned for completeness than for accuracy, since various dimensions of an element were not considered). For example, for those responses which involved plotting the location of enemy units, weapon sites, etc., the question was merely whether or not that unit, site, etc., had been identified, appropriateness of symbology and plotting accuracy notwithstanding. Any one given response, then, was evaluated in terms of whether or not each element was present or absent and one point was subtracted from the total for each missing element. Completeness scores were averaged across the set of eight tasks for each participant, and an analysis of variance was performed to determine if the two groups differed significantly in terms of this criterion. A summary of this analysis is presented in Table 5.

Table 5

ANOVA SUMMARY FOR COMPLETENESS SCORES OF SUBJECTS IN EXPERIMENTAL AND CONTROL GROUPS

Source	ss	df	ms	f	p
Between	140.45	1	140.45	9.46	<.001
Within	267.30	18	14.85		
Total	407.75				

Table 5 clearly shows that there was a significant difference between the two groups. The experimental group's performance ($\bar{X}$ = 37.4, sd = 3.41) was significantly higher (the responses more complete) than the control group's ($\bar{X}$ = 32.1, sd = 4.25). This finding was not unexpected, given the results obtained for the accuracy scores and the fact that the accuracy and completeness criteria are correlated (r = .99 and .93 for experimental and control groups respectively).

APPENDIXES

APPENDIX A REFERENCES DESCRIBING THE CAC SIMULATED TOS AS IT EXISTED PRIOR TO THE ADDITION OF FAP 1

1. Reoriented Tactical Operations System, RTOS/GOQS Demonstration: Revised RTOS/GOQS Data Base Definitions. BDM/CARAF - TR-75-031; BDM Services Co., Combined Arms Research and Analysis Facility, Fort Leavenworth, Kansas, 6 March 1975.

2. Reoriented Tactical Operations System, RTOS/GOQS Demonstration: Data Element Dictionary Current Formulation and Usage. BDM/CARAF - TR-75-060; BDM Services Co., Combined Arms Research and Analysis Facility, Fort Leavenworth, Kansas, 14 May 1975.

3. Reoriented Tactical Operations System, RTOS/GOQS Demonstration: Enemy Unit History File Requirements Description. BDM/CARAF - TR-75-070; BDM Services Co., Combined Arms Research and Analysis Facility, Fort Leavenworth, Kansas, 11 June 1975.

4. Reoriented Tactical Operations System, RTOS/GOQS Demonstration: Final Report, Volume III, Data Base Input User/Planner Guide. BDM/CARAF - FR-75-074; BDM Services Co., Combined Arms Research and Analysis Facility, Fort Leavenworth, Kansas, 7 July 1975.

5. Reoriented Tactical Operations System, RTOS/GOQS Demonstration: Final Report, Volume II, GOQS User/Plannner Guide. BDM/CARAF - FR-75-075, BDM Services Co., Combined Arms Research and Analysis Facility, Fort Leavenworth, Kansas, 7 July 1975.

6. Reoriented Tactical Operations System, RTOS/GOQS Demonstration: Final Report, Volume I: Executive Summary. BDM/CARAF - FR-75-075; BDM Services Co., Combined Arms Research and Analysis Facility, Fort Leavenworth, Kansas, 7 July 1975.

APPENDIX B TASK COMPLETION TIME FORM

Subject's Name _____

Experimental Condition _____
Control Condition _____
(Check One)

Question/Task No.	Task Completion Time (in seconds) - This is the interval between presentation of question to Subject until he records his response in the manner specified.	REMARKS
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

APPENDIX C QUERY COMPOSITION/ANNOTATION TIME FORM

Subject's Name _____

Experimental Condition _____
Control Condition _____
(Check One)

Question No. Part No. Attempt No.	Composition Time (in Seconds)	Post Query Computer Response Time (in Seconds)	Was Query Compatible + if Yes - if No	Did correct system query yield data subject requested? + if Yes, - if No.	Query Translation Time (in Seconds)	Call, "G" Computer Response Time	REMARKS - Were there problems not covered in preceding columns? If so, describe them here.

APPENDIX D PART I. PRELIMINARY INSTRUCTIONS FOR SUBJECTS IN AUTOMATED CONDITION

You are here today to participate in an experiment. The purpose of the experiment is to determine how well intelligence analysts/OB technicians, like yourself, can perform job related tasks with either computer data files or manual and computer data files. Thus, some of the participants, including yourself, will use only the computer to perform a series of tasks. Other participants will have access to some information in the computerized data files, but will rely more heavily on manual files to accomplish the same tasks. You will be given more detailed instruction concerning what will be required of you later. On the page following these instructions is presented a detailed description of the general and special situation of the 54th Mechanized Infantry Division, the unit to which you will assume you have been assigned for the purposes of this experiment. The division is part of a corps force operating in Western Europe under mid-intensity conflict conditions. Read these descriptions very carefully so that you are fully read into the situation. Also, you will want to study the map and overlay on the easel in front of you which shows the area in which the battle is being fought, the disposition of friendly units, and the location of enemy units that are known to be in contact on the FEBA. You will be given 15 minutes to study the map and the description of the 54th Mechanized Infantry Division. Do you have any questions at this point?

APPENDIX D PART II. PRELIMINARY INSTRUCTIONS FOR SUBJECTS IN MANUAL CONDITION

You are here today to participate in an experiment. The purpose of the experiment is to determine how well intelligence analysts/OB technicians, like yourself, can perform job-related tasks with either computer data files or manual and computer data files. Thus, some of the participants will exclusively use the computer to perform a series of tasks. Other participants, including yourself, will have access to some information in the computerized data file but will rely more heavily on manual files (OB and TI files) to accomplish the same tasks. You will be given more detailed instructions concerning what will be required of you later. On the page following these instructions is presented a description of the general and special situation of the 54th Mechanized Infantry Division, the unit to which you will assume you have been assigned for the purposes of the experiment. The division is part of a corps force operating in Western Europe under mid-intensity conflict conditions. Read these descriptions very carefully so that you are fully read into the situation. You will want to study the map and overlay on the easel in front of you which shows the area in which the battle is being fought, the disposition of friendly units, and the location of enemy units that are known to be in contact on the FEBA. You will be given 15 minutes to study the description of the 54th Mechanized Infantry Division and the situation map. Also, you should become familiar with the composition and contents of the manual OB and target intelligence files that you will use in the experiment. After you have thumbed through the files, signal the experimenter and he will give you a series of four questions, one at a time, for which you will be required to provide answers. This should further assist you in becoming familiar with and extracting information from these files. Do you have any questions at this point? If not, signal the experimenter when you are finished studying (1) the situation map, (2) the description of the general and special situation of the 54th Mechanized Infantry Division, and (3) your manual files and that you are ready for the set of questions that should better familiarize you with the manual files.

APPENDIX E GENERAL AND SPECIAL SITUATIONS OF THE 54th MECHANIZED INFANTRY DIVISION

1. General Situation.

a. Warfare along the Western German border was initiated by Parkland forces, an aggressor whose doctrine and tactics are more or less the same as the Soviets', on 16 August 1975. Parkland forces were successful in making gains all along the Allied Front by using overpowering concentration of forces with powerful armored assaults supported by heavy fire power. Elements of the 10th (US) Corps were able to inflict heavy damages on attacking columns and following echelons through the use of tactical air, by using the best defensive terrain, and by shifting forces within the main battle area. The 10th (US) Corps was successful in conducting its planned retrograde operation to the Frankfurt-Wiesbaden area.

b. Friendly 10th (US) Corps is to establish its defense on the Frankfurt-Wiesbaden area by 221100 August with the 23d Armored Division, 54th Mechanized Infantry Division, and the 52d Mechanized Infantry Division north to south in that order. The Corps covering force is still in front of the main battle area.

2. Special Situation.

It is now 220600 August. The 54th Mechanized Infantry Division has just received a mission to defend from MB832806 to MA913533 NLT 221100 August; retain Frankfurt north of the Main River; establish covering forces vic line blue NLT 221100 August; assume control of maneuver elements detached from TFNIKE vic line blue and delay enemy forward of FEBA for a period of eight hours.

APPENDIX F FAMILIARIZATION TASKS FOR CONTROL GROUP

Subject Name_____

QUESTION 1

What are the effective and authorized strengths of the 3d Battalion of the 8th Field Artillery Regiment of the 2d Combined Arms Army?

	EM	Officers
Authorized strength		
Effective strength		

QUESTION 2

Who is the Deputy Commander of the 2d Combined Arms Army?

Name_____. Rank_____.

QUESTION 3

What is the state of training of the 20th Motorized Rifle Regiment of the 18th Mechanized Infantry Division?

Describe below the state of training and the regiment's specialty.

QUESTION 4

How many regimental size units have been identified (both confirmed and unconfirmed) in Named Area of Interest J?_____

APPENDIX G POST FAMILIARIZATION PHASE INSTRUCTIONS FOR CONTROL GROUP

For purposes of the experiment, you are to assume that you have just been assigned to the 54th Mechanized Infantry Division's G2 Section as the operations sergeant. The previous operations sergeant was killed a very short time ago when an artillery round hit and destroyed part of the G2 Section. Since the shelling, only that portion of the situation map which you studied a short time ago has been reconstructed. However, the manual OB and TI files were salvaged and there are data in some computer files that can be used to reconstruct the situation map and/or to provide answers to a series of nine questions that the G2 and the commander have formulated. The experimenter, playing the part of the G2, will ask you to obtain answers to these questions. You will be given the questions one at a time and you will answer each question as fully as you can before proceeding to the next question. <u>You will be timed, so it is important that you work as quickly, yet as accurately as you possibly can</u>. To answer the questions, you will have, as indicated above, two assets: your manual files and the computer files. Mr. Elmer, the terminal operator, will retrieve information for you from the computer's data base.

In order to familiarize you with what data the computer can provide you and how you should request the information (through Mr. Elmer), the following instructions are provided:

You should think of the computer as both a large file cabinet filled with information regarding the enemy, and as a "superfast" filing clerk who can retrieve information for you at a very rapid rate.

In using a manual filing system, you can only ask the filing clerk to retrieve <u>information</u> for you. You cannot ask the filing clerk to formulate an opinion or analyze the situation on such matters as when, where, or will the enemy attack. That sort of analysis work is your job. It is the same with the computer. It will provide you information quickly, but it <u>will not</u> do the analysis for you. Here are some examples of the types of questions that <u>cannot</u> be answered by the computer.

1. When and where will the enemy attack?

2. Will the enemy commit any reserve forces?

3. What will the commander of the 2d Armored Division elect to do next?

4. Based on the trends of enemy unit movements, what should I do next?

Here are some examples of questions that can be answered.

1. Give me a list of all enemy units below battalion level, their location, their authorized and effective strengths for personnel and equipment. The date and time that this information was reported, the morale rating of their units, and the activity associated with them.

2. Where are all the tactical bridges located that were reported in the last 24 hours in named area of interest B? Also, specify the type of traffic these bridges will support and exactly when they were identified.

3. Give me a list of all subordinate units of the 20th Motorized Rifle Regiment, their location, what activity they have been associated with, when this activity occurred, what their authorized and effective strengths are for personnel and equipment, what named area of interest they are located in, and have the output sorted by named area of interest.

4. What reported enemy activity has occurred in the grid area delineated by NA0883 in the last 10 days? Tell me when this activity occurred, where it occurred, what enemy unit was associated with it, in what named area of interest it is located, and sort the output in chronological order.

You should understand also that the computer operates at a very elementary level. That is, it provides information in small bits (such as the grid coordinates of an enemy unit, the time it was sighted, who made the sighting, and the reliability of the source). Therefore, you must be certain to specify all that you want the computer to tell you for each question. For example, suppose you want to know where all bridges in a certain area of the map are located. You would probably also want to know what type of bridge it is--tactical versus civilian, when it was located, etc. In phrasing your questions to the operator, you should specify all the elements of information regarding the subject you want to know about. To make it easier for you to obtain all the information you might want, the operator has been instructed to provide the following information for each of the questions:

a. The coordinates (location) of the event or enemy unit.

b. The time the event occurred.

c. The source of the information.

d. An evaluation of the source.

e. A description of the event or unit identified.

f. Any remarks that were provided by the source and entered into the data base.

If you want more specifics than the above elements will provide, you must inform the operator. Do not be concerned about requesting too many specifics, because the operator will act as an interpreter and will screen out specifics which he cannot access with the system. He will inform you of instances such as this or when he cannot provide the detail that you have requested.

The information in the computer's data base is cataloged into several different files. These files and a description of the type of data residing in each is presented below.

ENEMY UNIT SITUATION. This file contains information taken from raw data reports concerning an enemy unit, such as its location, size, parent-unit, the date-time that it was located and/or the date-time that the activity concerning this unit occurred.

ENEMY SITUATION DATA. This file contains information taken from raw data reports concerning enemy activity. It contains information such as reported enemy activity (ambush, attack, concentration, jamming, etc.), the date-time that the activity occurred, where it occurred, the enemy unit involved, and who reported the activity.

ENEMY UNIT HISTORY. This file contains messages in exactly the same format as the Enemy Unit Situation File. The difference is that the Enemy Unit History File, through its mode of automatic update and addition, keeps a historical record of data added to the Enemy Unit Situation File. This allows the intelligence analyst to analyze enemy unit movements, activities, weapons, personnel strengths, and trends.

To accomplish the tasks that will be given, you must use data which reside in those files described above and in your manual OB and TI files.

The first eight questions you will receive are very elementary questions in the sense that they do not require analysis or real correlation of data to answer. These questions can be addressed to the computer terminal operator more or less as they are. After you receive and study each of these questions to determine what you must provide, you will, in turn, place a requirement on the terminal operator. The operator will tell you where the data you have requested reside--in the computer, your manual files, or both. If the information resides in both the computer's data base and your manual files, the terminal operator will begin retrieving that portion which is in the computer data base. You must wait until he has finished retrieving this information and provided it to you before you begin searching for the rest of the information in your manual files. Of course, if all the data you have requested resides in your manual files, you will immediately begin searching for it here.

Question 9, the last one you will receive, is different from the first eight in that it is complex--it will require your skills in the intelligence area to analyze and put together various kinds of information in order to develop a conclusion or prediction. The procedure that you will follow in obtaining the information you need for this question will be slightly different from that used for the first group of questions. Again, you will get the question, study it to determine what is required and the information you will need to satisfy the requirement. Then, you will ask Mr. Elmer to provide the first piece of information you need. He will translate your question into a form which the computer can understand and attempt to obtain the information you have requested. As soon as he receives the output, he will tell you whether or not all the information available that relates to your question has come out of the computer or whether all or part of the information you have requested resides in your manual files. He will also annotate the computer output so that you can understand it and will provide it to you. After this is done, and if some of the information that you requested does reside in your manual files, you should immediately begin searching for it. If the situation requires you to search your manual files, do not lay another requirement on the terminal operator until you finish retrieving all relevant information from your manual files. You will continue this process until you have obtained all the information you feel you need to satisfy the requirement. For this last question, as well as for the previous ones, remember that you are being timed and, thus, that you should work as quickly, but as accurately as you can.

APPENDIX H POST FAMILIARIZATION PHASE INSTRUCTIONS FOR EXPERIMENTAL GROUP

For purposes of the experiment, you are to assume that you have just been assigned to the 54th Mechanized Infantry Division's G2 Section as the operations sergeant. The previous operations sergeant was killed a very short time ago when an artillery round hit and destroyed part of the G2 Section. Since the shelling, only that portion of the situation map which you studied a short time ago has been reconstructed. However, there are data in some computer files that can be used to reconstruct the situation map and/or to provide answers to a series of nine questions that the G2 and the commander have formulated. The experimenter, playing the part of the G2, will ask you to obtain answers to these questions. You will be given the questions one at a time and you will answer each question as fully as you can before proceeding to the next question. <u>You will be timed, so it is important that you work as quickly, yet as accurately as you possibly can</u>. To answer the questions, you will have, as indicated above, the computer files. Mr. Elmer, the terminal operator, will retrieve information for you from the computer's data base.

In order to familiarize you with what data the computer can provide you and how you should request the information (through Mr. Elmer), the following instructions are provided:

> You should think of the computer as both a large file cabinet filled with information regarding the enemy, and as a "superfast" filing clerk who can retrieve information for you at a very rapid rate.
>
> In using a manual filing system, you can only ask the filing clerk to retrieve <u>information</u> for you. You cannot ask the filing clerk to formulate an opinion or analyze the situation on such matters as when, where, or will the enemy attack. That sort of analysis work is your job. It is the same with the computer. It will provide you information quickly, but it <u>will not</u> do the analysis for you. Here are some examples of the types of questions that <u>cannot</u> be answered by the computer.

1. When and were will the enemy attack?

2. Will the enemy commit any reserve forces?

3. What will the commander of the 2d Armored Division elect to do next?

4. Based on the trends of enemy unit movements, what should I do next?

Here are some examples of questions that can be answered.

1. Give me a list of all enemy units below battalion level, their location, their authorized and effective strengths for personnel and equipment. The date and time that this information was reported, the morale rating of their units, and the activity associated with them.

2. Where are all the tactical bridges located that were reported in the last 24 hours in named area of interest B? Also, specify the type of traffic these bridges will support and exactly when they were identified.

3. Give me a list of all subordinate units of the 20th Motorized Rifle Regiment, their location, what activity they have been associated with, when this activity occurred, what their authorized and effective strengths are for personnel and equipment, what named area of interest they are located in, and have the output sorted by named area of interest.

4. What reported enemy activity has occurred in the grid area delineated by NA0883 in the last 10 days? Tell me when this activity occurred, where it occurred, what enemy unit was associated with it, in what named area of interest it is located, and sort the output in chronological order.

You should understand also that the computer operates at a very elementary level. That is, it provides information in small bits (such as the grid coordinates of an enemy unit, the time it was sighted, who made the sighting, and the reliability of the source). Therefore, you must be certain to specify all that you want the computer to tell you for each question. For example, suppose you want to know where all the bridges in a certain area of the map are located. You would probably also want to know what type of bridge it is, tactical versus civilian, when it was located, etc. In phrasing your questions to the operator, you should specify all the elements of information regarding the subject that you want to know about. To make it easier for you to obtain all the information you might want, the operator has been instructed to provide the following information for each of the questions:

a. The coordinates (location) of the event or enemy unit.

b. The time the event occurred.

c. The source of the information.

d. An evaluation of the source.

e. A description of the event or unit identified.

f. Any remarks that were provided by the source and entered into the data base.

If you want more specifics than the above elements will provide, you must inform the operator. Do not be concerned about requesting too many specifics, because the operator will act as an interpreter and will screen out specifics which he cannot access with the system. He will inform you of instances such as this or when he cannot provide the detail that you have requested.

The information in the computer's data base is cataloged into several different files. These files and a description of the type of data residing in each is presented below.

ENEMY UNIT SITUATION. - This file contains information taken from raw data reports concerning an enemy unit such as its location, size, parent-unit, the date-time that it was located and/or the date-time that the activity concerning this unit occurred, etc.

ENEMY SITUATION DATA. - This file contains information taken from raw data reports concerning enemy activity. It contains information, such as reported enemy activity (ambush, attack, concentration, jamming, etc.) the date-time that the activity occurred, where it occurred, the enemy unit involved, who reported the activity, etc.

ENEMY UNIT HISTORY. - This file contains messages in exactly the same format as the Enemy Unit Siutation File. The difference is that the Enemy Unit History File, through its mode of automatic update and addition, keeps a historical record of data added to the Enemy Unit Situation File. This allows the intelligence analyst to analyze enemy unit movements, activities, weapons, personnel strengths, and trends.

ENEMY ORDER OF BATTLE. - This file contains information regarding enemy units. It contains such data as parent units, subordinate units, unit commanders, combat effectiveness rating, equipment and personnel status (authorized vs on-hand), equipment, supply, morale, personnel, and training readiness ratings (a scale of 1-4 where 1 is the highest level), what weapons (light, medium, and heavy tanks, artillery, etc.) are organic to and present in the various units.

ENEMY TARGET INTELLIGENCE. - This file contains information regarding all known enemy targets. Specific data contained are target number, a description of the target, its altitude, location, location error, the source of information, confirmation (yes/no), the date-time that the target was located, recommended means of engagement and others.

To accomplish the tasks you will be given, you must use data which resides in those files described above.

The first eight questions you will receive are very elementary questions in the sense that they do not require analysis or real correlation of data to answer. Each of these questions can be addressed to the computer terminal operator more or less as they are. After you receive and study each of these questions to determine what you must provide, you will, in turn, place a requirement on the terminal operator. The operator, in

turn, will translate your request into an appropriate system query or queries, provide you the output, and explain what the output means in terms you can understand. Once you get the output and understand what it means, you will then respond in the fashion specified for the particular question you are trying to answer.

Question 9, the last one you will receive, is different from the first eight in that it is complex--it will require your skills in the intelligence area to analyze and put together various kinds of information in order to develop a conclusion or prediction. The procedure that you will follow in obtaining the information you need for this question will be slightly different from that used for the first group of questions. Again, you will get the question, study it to determine what is required and the information you will need to satisfy the requirement. Then, you will ask Mr. Elmer to provide the first piece of information you need. He will translate your question into a form which the computer can understand and attempt to obtain the information you have requested. Again, when he receives the output, he will provide it to you and translate it into terms you can understand. If you do something with the information, such as plot it on the situation map, you must complete that activity before laying another requirement on the terminal operator. You will continue this process until you have obtained all the information you feel you need to satisfy the requirement. For this last question, as well as for the previous ones, remember that you are being timed and, thus, that you should work as quickly, but as accurately as you can.

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